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Study of the correlation between the medical examination, the physical fitness index, the intelligence quotient and the scholastic achievement of sixty girls at the Posse school of physical education.

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THESIS

A STUDY OF THE CORRELATION BETWEEN THE MEDICAL EXAMINATION, THE PHYSICAL FITNESS INDEX, THE INTELLIGENCE QUOTIENT AND THE SCHOLASTIC ACHIEVEMENT OF SIXTY GIRLS AT THE POSSE SCHOOL OF PHYSICAL EDUCATION

Submitted by

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In partial fulfillment of requirements for the degree of Master of Education

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OUTLINE OF THESIS

Page

I Introduction.....1 - 3

1. Statement of Problem.....1 - 2
2. Objectives of the Study..... 2
3. Definition and Explanation of Terms.....2 - 3

II Other Investigations in This Field.....4 -12

1. The Medical Examination and the Physical Fitness.....4 - 8
   a. The Deaver Scoring System.....4 - 5
   b. The Hyde Park Scoring System.....4 - 5
   c. Franzen Study on Growth and Nutrition..... 5
   d. Rogers's Report on the P.F.I. in Revealing Physical Condition..... 6
   e. Chamberlain-Smiley Study on the Correlation between the Medical Examination and the P.F.I.....6 - 8
2. Physical Fitness and Intelligence.....8 -10
   a. Giauque's Study on the Lynbrook High School Boys.....8 -10
   b. Rogers's Correlation..... 9
3. The I.Q. and Scholastic Achievement.....10-12
   a. The Flemming Study on Pupils at the Horace Mann High School.....10-12

III The Procedure.....13-33

1. The Data Used in This Study..... 13
2. The Medical Examination.....13-14
3. How the Medical Examination Was Scored.....14-31
4. Measurement of Physical Fitness..... 32
5. Measurement of Intelligence.....32-33
6. Measurement of Scholastic Achievement..... 33

IV Analysis of the Medical Examination and the P.F.I.....34-39

Page

V Analysis of the P.F.I. and the I.Q.....40-43

VI Analysis of the P.F.I. and Scholastic Achievement.....44-47

VII Analysis of the I.Q. and Scholastic Achievement.....48-53

VIII Conclusions.....54-55

1. Mathematical Scoring of the Medical Examination..... 54

2. Correlation between the Medical Examination and the P.F.I..... 54

3. Correlation between the P.F.I. and the I.Q..... 54

4. Correlation between the P.F.I. and Scholastic Achievement.....54-55

IX Recommendations.....56-58

1. Proposed Plan for Further Study in Establishing Medical Norms and Rating the Medical Examination.....56-57

2. Recommendations to Improve The Measurement Program at Posse School.....57-58

X Bibliography.....59-60

XI Appendix.....61-91

1. Medical Examination Forms Used at Posse School.....61-68

a. The Family History..... 61
b. The Personal History.....61-62
c. The Physical Examination..... 63
d. The Medical Examination.....64-67
e. The Score Sheet.....68-73

2. The Deaver Score Sheet.....74-80
3. The Hyde Park Score Sheet.....81-91

A STUDY OF THE CORRELATION BETWEEN THE MEDICAL EXAMINATION, THE PHYSICAL FITNESS INDEX, THE INTELLIGENCE QUOTIENT AND THE SCHOLASTIC ACHIEVEMENT OF SIXTY GIRLS AT THE POSSE SCHOOL OF PHYSICAL EDUCATION

I

INTRODUCTION

Within recent years, the question of the relationship of physical fitness to mental ability and to scholastic achievement has been the subject of much study, but as yet no positive relationship between them has been reported. Whether there is a positive relationship between physical fitness and intelligence is a moot question, but it seems reasonable that one should exist between physical fitness and scholastic achievement. Any change in the functioning of one part of the body has an effect on the body as a whole, so closely are the different systems interrelated. Learning is a function of the central nervous system, including the brain, spinal cord and nerves. Muscular activity is a function of voluntary muscle. Both the central nervous system and the muscular system are parts of the whole body, not separate entities. Thus, it seems logical to assume that any decrease in efficiency of the muscular system should have a corresponding effect on intelligence, and it has been demonstrated that a decrease in physical fitness does have an effect on mental activity. Learning also depends on interest and application to the task at hand, and

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how can interest and application be maintained when one is suffering from headache, digestive disturbances, or earache? The greater the physical fitness, the greater the capacity for mental achievement. If a positive relationship between these variables can be discovered it would be of tremendous value in improving educational efficiency.

The study reported in this thesis was conducted during the year 1935-36 at the Posse School of Physical Education, and was undertaken in an attempt to shed further light on this question, and to improve the measurement program and the teaching techniques at this school.

Objectives of the Study

The specific objectives of this study are:

1. To determine the correlations between:
    a. The medical examination and the physical fitness index
    b. The physical fitness index and the intelligence quotient
    c. The physical fitness index and the scholastic achievement
    d. The intelligence quotient and scholastic achievement.
2. To find a better basis for evaluating the medical examination as a measure of physical fitness.

Definition and Explanation of Terms

The Medical Examination. The medical examination is made in order to reveal all functional and organic defects, whether due to inheritance, as shown by the family history, to past disease or to poor hygienic habits. The results of the medical examination

indicate the degree of physical efficiency of the body.

Physical efficiency as indicated by the medical examination is therefore taken to mean normal functioning of all the systems of the body, with the greatest amount of efficiency in all its parts. This may be in the muscular system, as indicated by the capacity for activity; in the nervous system, as partly indicated by the capacity for mental achievement; or in all other systems, as indicated by metabolism, circulation and excretion. Taken altogether it means, stated simply, the greatest amount of efficiency in the living organism considered as a whole.

Physical Fitness. Physical fitness, as indicated by the physical fitness test, means the "capacity for purposeful activity". (1)

Intelligence. Intelligence is taken to mean the capacity of the individual to maintain a definite direction in his thinking, the ability to adapt his thinking to a desired end, and to adjust it to new requirements, new problems and new conditions of living. (2)

Scholarship. For the purpose of this study scholarship is taken to mean the amount of learning acquired in the academic courses, as indicated by the final rank achieved. This final rank is a composite one from daily class work, examinations, note books, laboratory work, written papers and special assignments.

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(1) Rogers, Frederick Rand. Fundamental Administrative Measures in Physical Education. Newton, Mass., The Pleiades Press, 1932, p. 116.

(2) Terman, Lewis M. The Measure of Intelligence. Boston, Mass. Houghton Mifflin Co., 1916, pps. 44-47.

II

OTHER INVESTIGATIONS IN THIS FIELD

The Medical Examination. Some studies have been made on physical fitness as indicated by the medical examination, or by some element or elements of the medical examination, but there are very few which give a statistical correlation between the medical examination and the physical fitness index. These studies are on men and boys and, as far as the writer knows, this is very likely the first attempt to find such a correlation for young college women.

Dr. G.G. Deaver, formerly Health Advisor at the Y.M.C.A. College in Chicago, Illinois, has compiled a thorough medical examination with an excellent scoring sheet. (3) The chief objective of this medical scoring system is the motivation of the medical examination for the men and boys who are admitted to the physical department of the Y.M.C.A.

The Hyde Park Department of the Chicago Y.M.C.A. has a somewhat similar score sheet for health examinations. (4) This system has an excellent summary divided into three classes A, B, and C, which is listed in full in the Appendix.

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(3) Deaver, Dr. G.G. Motivating Physical Examinations. Chicago, Ill., The Y.M.C.A. Association Press.

(4) Hyde Park Department of the Chicago Y.M.C.A. Basis of Grading Health Examinations. Mimeographed material.

All physical defects and poor personal habits are heavily scored in these two examinations. The listed defects and the score serve as a guide to the physical director in assigning normal and corrective gymnasium work; they stimulate the individual in improving his physical condition; and they serve as a check in watching the progress or retrogression of each individual during his years of association with the Y.M.C.A.

There is no comparison of the results of the medical examination with those of the physical fitness test. The scores indicate defects only and show no statistical relation to physical fitness.

In Monograph II of the American Child Health Association, Franzen (5) reports the results of an investigation on objective measures of growth and nutrition. The low validity of age, height, weight as a nutritional index has been fully established, and there is only a correlation of .60 between the judgements on nutrition by well trained physicians. The A.C.H. method involves certain anthropometric measurements of the skeleton, muscular and subcutaneous tissues. Statistical tables of norms have been compiled and there is a formula for computing the nutritional index. Judgement of nutritional status by this method is a time consuming process and requires specially constructed measuring devices and careful preliminary training. The grip strength alone is a more simple and more accurate measure of nutrition. (6)

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(5) Franzen, Raymond. Physical Measures of Growth and Nutrition. New York, The American Child Health Association, Monograph II.

(6) Rogers, Frederick Rand. Fundamental Administrative Measures in Physical Education. Newton, Mass., the Pleiades Press, 1932, p. 33.

A report by Rogers (7) indicates the high validity of the P.F.I. test as an index of the organic fitness or lack of fitness of the body. When the doctor's subjective judgement of physical fitness, as indicated by the medical examination, and physical fitness, as indicated by the P.F.I. test, do not agree, the doctor is in error. The P.F.I. frequently reveals organic defects undetected by the medical examination, and low P.F.I.'s are an indication for a most searching medical examination, with the full assistance of the laboratory and X-ray in many instances. When organic defects are not obvious through the medical examination, the P.F.I. test would appear to be a more delicate and a more accurate measure of the physical status of the body than is the medical examination.

In the Spring of 1930, Chamberlain and Smiley made a study (8) of sixty-five Cornell students, comparing physical fitness as indicated by the medical examination and the P.F.I. test. The results of the medical examination were classified into three groups. In group A are the markedly superior, free from defects, with good health habits, and in an efficient functional state of health at all times. In group B are those with an average functional health, whose defects, if any, are not serious enough to interfere with normal function. In group C are the handicapped, those with organic defects of sufficient magnitude to impair normal efficiency. The

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(7) Rogers, Frederick Rand. The Significance of Strength Tests in Revealing Physical Condition. The Research Quarterly of the American Physical Education Association, Vol. V, No. 3, October 1934, pps. 43-46.

(8) Chamberlain, Carl G. and Smiley, Dr. Dean F. Functional Health and the Physical Fitness Index. The Research Quarterly of the American Physical Education Association, Vol. II, No. 1, March 1931, pps. 193-198.

results of the P.F.I. test were also classified into three groups. In group A are the superior, with a P.F.I. rating of over 120. In group B are the average, with a P.F.I. rating between 80 and 120. In group C are the handicapped, with a P.F.I. rating below 80.

Table I

Comparison of Chamberlain-Smiley Ratings

Group	Rating	Med. Exam.	P.F.I.
A	Superior	5	7
B	Average	41	42
C	Handicapped	19	16

The defects listed under group C are all organic, many of them serious. Among these are: "Ankylosis of the right knee, recent appendectomy, amputation of the right leg, arthritis, frontal sinusitis, undescended testicle, infected knee, gingivitis, deviated septum, Perthe's disease of the right hip, loss of vision in the right eye, bursitis of the left elbow, large inguinal rings, tuberculosis history, immobilization of sacro-iliac joint, atrophied leg following poliomyelitis, overweight and underweight." (9)

1. The P.F.I. rating agreed with the medical rating in 3 out of 5 superior cases.

2. The P.F.I. rating agreed with the medical rating in 36 out of 42 average cases.

3. The P.F.I. rating agreed with the medical rating in 13 out of 19 handicapped cases.

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(9) Chamberlain and Smiley. Ibid., p. 196.

4. In the total group, the P.F.I. rating agreed with the medical rating in 52 of the 65 cases, an 80 per cent agreement.

5. The correlation coefficient between the two, computed by the standard product-moment formula is .60 with a probable error of .05.

The following quotation by the authors is important when a comparison of their correlation is made with the Posse figures.

> "Had it been expedient to rate accurately from both functional health and physical fitness viewpoints a sufficient number of classifications, then the coefficient of correlation would have undoubtedly been higher." (10)

In this very subjective form of medical examination it is impossible to classify closely into a larger number of groups. If some method can be devised to score the medical examination on an accurate mathematical basis there is little doubt but a truer correlation between the two will be found.

The Physical Fitness and Intelligence. Two researches on the correlation between physical fitness and intelligence give a good resume of the relationship between these two variables. One was made by Giauque (11) on sixty senior boys at the Lynbrook, New York, High School. The correlation coefficient was found to

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(10) Chamberlain and Smiley. Ibid., p. 196.

(11) Giauque, Charles D. An Inquiry into the Correlation between Physical Fitness and Scholastic Standing. Supplement to The Research Quarterly of the American Physical Education Association, Vol. VI, No. 1, March 1935, pps. 271,274.

be minus .25. The other, reported by Rogers (12) on 347 High School boys showed a correlation of minus .03 in the Fall of 1924, and one of minus .10 in the Spring of 1925. Certain writers "agree that the 'overlapping' between physical abilities of those differently endowed mentally is so great as to render physical measures useless as measures of mental status." (13) In opposition to this view, others "propose various physical measures as of primary importance in grading pupils of certain ages for scholastic programs." (14)

Analysis of the data shows that there is unquestionably a real relationship between the two, although it is impossible to determine by present methods just what this relationship is. The product-moment method indicates that the correlations are most marked from the years 15 to 18. (15) There is much confusion and uncertainty concerning these two variables under discussion and, while there are many who feel that this relationship is high they are unable to find convincing proof of it. (16)

Giauque, in his study of the Lynbrook High School boys (17) found a correlation of plus .10 between physical fitness and

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(12) Rogers, Frederick Rand. Fundamental Administrative Measures in Physical Education. Newton, Mass., Pleiades Press, 1932, p. 246.

(13) Rogers, Frederick Rand. Physical Capacity Tests in the Administration of Physical Education. Teachers College, Columbia University, Contributions to Education, No. 173, 1926, Chap. VII, p. 71.

(14) Rogers, Frederick Rand. Ibid., p. 72.

(15) Rogers, Frederick Rand. Ibid., pps. 271-273.

(16) Rogers, Frederick Rand. Ibid., pps. 76-77.

(17) Giauque, Charles D. Ibid., pps. 271-273.

scholastic marks in general. The particular object of his research was to find the correlations when changes were taking place in both variables, rather than the correlation at any one particular time, and, while it is the latter which will be used for comparison with the figures of the Posse study, mentioned on page 45, it is interesting to note Giauque's correlation figures, which follow:

1. Correlation coefficient between the P.F.I. and scholastic marks for pupils whose P.F.I.'s increased was minus .15.

2. Correlation coefficient between the P.F.I. and scholastic marks for pupils whose P.F.I.'s decreased was plus .16.

The I.Q. and Scholastic Achievement. Many reliable studies have been made on the correlation between the I.Q. and the scholastic achievement for elementary schools, but the tests used are of a type fitted only to elementary school work, so that the results obtained are not comparable with the results of this research. One of the most comprehensive reports along this line in secondary schools, by Flemming (18), contains a good summary of all the best known similar work, as well as a detailed analysis of achievement in the Horace Mann School of New York City, with correlations between intelligence, school marks, teachers' estimates of intelligence, and certain mental, physical and character traits

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(18) Flemming, Cecile White. A Detailed Analysis of Achievement in the High School. Teachers College, Columbia University Contributions to Education, No. 196, 1925.

which are necessary for success in school work.

As the Otis group test of mental ability is used in the Posse research, the following table on the Otis Higher Form correlations was compiled from figures from the Flemming thesis.

Table II

Correlation Between the Otis Mental Test and Scholastic Achievement

Test	Grade	Number	School Marks	Reported by
Otis	High School	64	.45	Demonstration School University of Arkansas
Otis	XII XI X IX	26 27 46 74 173	.66 .59 .55 .58 .60	West. Study at Needham, Mass.
Otis	IX	153	.54	Keener. Chicago, Ill.
Otis	IX	57	.31	Franzen. Des Moines, Iowa.
Otis	XI XII	240 204	.55 .57	Proctor. Bangor, Maine
Otis	Junior High	285 girls 268 boys	.5237	Flemming. Horace Mann School, New York City.
Otis	Senior	Total 553	.3199	

The correlation between the I.Q. and the school marks in this table show a range from .31 to .66. Since the Otis test has a reliability coefficient of .967 and the unreliability of school marks is well known, one reason for this range of .29 is evident. Moreover, many other elements must be considered over and above

native intelligence in ranking student achievement. Industry, special interests and dis-interests, pride in accomplishment, general physical condition, extra-curricular activities, parent attitude, nationality, living conditions and environment have much to do with pupil success as indicated by ranks achieved in school work.

III

THE PROCEDURE

The following measurement procedures were used in this study:

1. The complete medical examination, consisting of
   a. The family history
   b. The past and present personal history
   c. The physical examination
   d. The medical examination proper.
2. The Rogers's physical fitness tests.
3. The Otis Self-Administering Tests of Mental Ability, Higher Examination, Forms A and C.
4. The scholastic marks.

The Medical Examination

The complete medical examination * consisting of four parts, took from 45 to 60 minutes per individual. All examinations were in the nude. The family history and personal history forms were filled out by each student. Posture pictures were taken by two of the physical education instructors under the personal supervision of the medical examiner, using the Danforth improved shadow-silhouettograph method. (19) These were graded by the instructors.

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* See Appendix for medical examination forms.

(19) Danforth, Harold R. Advantages of a New Shadow-Silhouettograph over the Original. Supplement to The Research Quarterly of the American Physical Education Association, Vol. VI, No. 11, March 1935, pps. 50-53.

During the medical examination posture was checked by personal observation and the condition of the feet was noted. A careful and searching medical examination followed the taking of the posture pictures, taking at least 30 minutes for each individual.

All of the examinations were then carefully studied and all variations from normal, whether organic or functional, were marked in red pencil, with notes as to the seriousness and the effect on the general physical condition. Later these were re-checked by the examiner to insure accuracy.

How the Medical Examination Was Scored

Having obtained the data from the medical examinations, on all functional and organic defects, then came the problem of finding a scoring system which would indicate as accurately as possible the effect of these variations from normal on the general physical fitness of the individual. Few attempts have been made to score medical examinations mathematically, and no system of scoring will be entirely satisfactory because of the lack of statistical medical norms.

Medical examinations in practically all schools and colleges are marked by some system, similar to the following, to show normal conditions and variations from normal.

1. N, check mark (✓), O.K., for normal condition or corrected abnormal condition.

2. One plus sign (+), for slight deviations from normal, with no apparent effect on the functioning of the body.

3. Two plus signs (++), for more serious defects, which are

impairing, or may impair, the health. Such defects are brought to the attention of the student and the family and are to be watched by the family physician. Pupils with two plus marks (++) on their medical examinations are closely supervised during the whole year by the school medical examiner.

4. Three plus signs (+++), for marked defects requiring immediate attention by the family physician or dentist. This requires a follow up of the school medical examination to check the correction of the defects.

5. Usually a note is added as to general condition of health and endurance. Individuals are often grouped as follows:

A. Normal condition of health.

B. Fairly normal condition, with some defects requiring watching.

C. Markedly defective.

Or an indication of the program in the physical education department may be made:

1. Regular course, all sports, competition allowed.

2. Restricted course, lighter sports, no competition.

3. Light course, no sports.

4. Excused from all physical education.

5. Daily rest in a designated rest room, restriction of academic program.

Such a system of marking medical examinations is of value in correcting defects and improving physical condition but is of little or no value in attempting to give a mathematical rank to the physical condition.

The Deaver and Hyde Park systems of scoring * have great value from the standpoint of their particular objectives but they are of limited value from the standpoint of finding an accurate mathematical rating of physical fitness as indicated by the medical examination, comparable to the rating of physical fitness as measured by the Rogers's P.F.I. test.

The method of accurately rating physical fitness from the medical examination, as used in this study, differs to a marked degree from that of the Deaver and Hyde Park methods, which grade poor hygienic habits and slight deviations from normal very severely, and markedly undergrade serious organic conditions. The emphasis in the Chicago scoring is on improving and correcting defects, rather than on grading the physical fitness of the whole body.

It is a well known fact that the human body may harbor both functional and organic defects for some time before much evidence of any change in physical fitness appears. To detect just when the change in physical fitness does appear is difficult. To measure the amount of change is even more difficult, for physical fitness varies from hour to hour. The P.F.I. test frequently picks up these variations when they cannot be found by the medical examination. Great care must be taken in scoring the medical examination for many defects are closely related and severe scoring on all points may mean repetition, and thus inaccuracy appears. One must consider the body as a whole in giving the final score.

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* See Appendix.

No system of scoring will be reliable unless there are reliable norm tables for comparison with individual variations, both functional and organic. And there are few medical norm tables available. The posture, blood pressure, pulse-exercise reaction and age, height weight relationship have only moderately reliable norms, and for all other physical conditions the only norms are ideal, subjective ones, built up by each individual physician after years of experience in examining. There are several bodily types of individuals and these are differently influenced by heredity and environment. Moreover, up to adolescence, changes in the body are rapid and differ greatly for the different types. This seriously complicates the building of medical norms. There is no question of the validity of the medical examination and its reliability is .90 for repeated examinations by the same physician, and .60 for examinations by different physicians. (20) These few facts clearly show that, until reliable norms on all points are established, accurate mathematical scoring cannot be accomplished, and, that for the present, all scoring must be very largely subjective.

An attempt is now made to re-score organic and functional defects from the standpoint of present physical condition. At the present there seems to be no way to score the medical examination objectively, and the author confesses that her scoring is largely subjective, but it is based on over twenty years of

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(20) Rogers, Frederick Rand. Fundamental Administrative Measures in Physical Education. Newton, Mass., The Pleiades Press, 1932, pps. 117, 144.

school examining, with the opportunity of following individual students through the entire school system.

The family history, the personal history, the physical and medical examinations will now be discussed point by point, compared with the Deaver and Hyde Park scoring, and re-scored on a basis which considers the degree to which the functional and organic lesions affect the general physical fitness.

The Family History. The family history is not scored, inasmuch as defects which are inherited are scored under the medical examination proper.

The Personal History. Many diseases leave no permanent effect on the body, others, such as scarlet fever, frequent tonsillitis, infantile paralysis, do sometimes leave a permanent effect. These, brought to light by the medical examination, can be traced back to past illness. Such lesions are scored under the medical examination proper.

The hygienic habits which are most apt to cause a decrease in physical fitness are loss of sleep, excessive use of tobacco, tea and coffee and constipation. All individuals do not need the same amount of sleep and other poor health habits affect some individuals more than they do others. This must be considered in scoring.

While the author entirely approves of vaccination for smallpox, it in no way increases physical fitness and, in some instances may even decrease it, if there is any allergic tendency, or if the

individual is in poor general condition. For this reason it is not scored.

The following tables show the new scoring used in this study, and give corresponding scores from the Deaver and Hyde Park examinations.

Table III

Items in the Personal History

Comparison of Deaver, Hyde Park and Posse Scoring

Item	Deaver	Hyde Park	Posse
Sleep	0	1/2 for each hour under 8	1/2 to 1 depending on effect
Tobacco	0	1 if used 2 excess	1 if any effect
Tea, Coffee	0	1-3	1/2 if excessive
Indigestion	0	0	1/2-1 depending on severity
Constipation	0	2-3	1/2-1 depending on severity
Vaccination	2	1	0

The Physical Examination. The age, height, weight relationship is important, for weight determines to a large extent physical accomplishment. Extreme underweight is frequently a symptom of general debility, and excessive overweight is a marked disability and a serious menace to health, for degenerative diseases are found much more often in this type of individual. Excessive overweight must,

therefore, be more heavily penalized than in the Deaver and Hyde Park tables. * Otherwise scoring is about the same. The Age, Height, Weight Tables for Women compiled by the Association of Life Insurance Directors and the Actuarial Society of America were used in estimating weight, for these are the most reliable tables of the present day.

The amount and condition of the musculature indicates the capacity for activity, and poor musculature should be penalized.

The body adapts itself quite well to a considerable degree of poor posture, thus it is not scored unless there are symptoms of fatigue, eye strain, muscular strain, or pressure on internal organs. Functional hyphosis, lordosis, and mild scoliosis are included under poor posture. Scoring depends on interrelations. The importance of lordosis as a cause of debility should be emphasized. Organic postural defects, kyphosis, lordosis or scoliosis, since they are incapable of improvement and cause considerable debility, are scored more heavily.

The Harvard Charts were used in forming subjective judgements of posture, and the angle measurement norms of Goldthwaite (21) for objective measurement.

The foot condition is taken as a whole in relation to the amount of disability present. Pain in the foot and leg, corns, calluses, bunions, toe and joint deformity indicate the whole

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* See Appendix.

(21) Stafford, George T. Preventive and Corrective Physical Education. New York, A.S. Barnes and Co., 1934, pps. 104-106.

picture and are used as the measure of disability in scoring.

Table IV

Items in the Physical Examination

Comparison of Deaver, Hyde Park and Posse Scoring

Item	Deaver	Hyde Park	Posse
Age, Ht., Wt.	1-3	1-3	1-5
Musculature	1/2-3	1-3	1-2
Posture	1-3	1-4	1/2-1
Kyphosis	0	0	1-5 depending on effect
Lordosis	0	1-3	1-5 depending on effect
Scoliosis	1-3	1-3	1-5 depending on effect
Feet, Knees	1/2 knock-knee and bow-legs	0-1 knock-knee, bow-legs	0-1/2 marked knock-knee, bow-legs 1-3 foot as a whole
Longitudinal arch	1-3	1-3	as part of whole foot condition
Transverse arch	1-3	1-3	as part of whole foot condition
Toes	1-3	1-3	as part of whole foot condition
Joints	1-3	1-3	as part of whole foot condition

The Medical Examination: Sense Organs. Undoubtedly vision does cause disability but, if properly corrected and without symptoms, it affects physical fitness but little and is not scored. If uncor-

rected it is scored from 1/2 to 2. The eye is considered as a whole and is scored for vision and all other conditions grouped together, the score depending on the cause and effect on fitness.

Ear conditions are scored in relation to effect on physical fitness. Decrease in hearing is unfortunate but affects fitness little and is therefore scored lightly. Under the Deaver and Hyde Park methods both eye and ear conditions are scored heavily, often, it seems, with repetition. From the objective of correction this is legitimate, from that of effect on physical fitness the scoring is too high and repetitions must not occur.

Table V

Items in the Sense Organs

Comparison of Deaver, Hyde Park and Posse Scoring

Item	Deaver	Hyde Park	Posse
Vision, distant	1/2-1 1/2	1-3	Score if uncorrected
Vision, near	1/2 for each type	1 for each type	only
Astigmatism	2	2	1/2-1
V. corrected	1	1	0
Form	3	3	0
Color vision	2	2	0
Muscle balance	1/2-2	1/2-2	1/2
External affections	1-3	1-3	Scored as a group,
Pupils	3	3	depending on cause.
Conjunctiva	1-3	1-3	Serious local lesions
Cornea	3	3	and lesions of the
Iris	2	2	brain and central
Lens	1-3	1-3	nervous system are
Retina	3	3	scored 2-5.
Hearing	1-3	1-3	1/2-1
Ear canal	1-2	1-2	0
Ear drums	1	1	under hearing
Weber Test	2	1-2	0

The Nose, Throat and Mouth. Conditions of the nose, throat

and mouth have an effect on physical fitness only if symptoms of obstruction to breathing and of systemic absorption are present. Nasal obstruction causes mouth breathing and systemic absorption is serious and has a marked effect on health. The latter should be scored heavily.

Table VI

Items in the Nose, Throat and Mouth

Comparison of Deaver, Hyde Park and Posse Scoring

Item	Deaver	Hyde Park	Posse
Septum	1-3	1-3	1-2
Pharynx	1	1	1/2
Larynx	1/2	1	1
Tonsils	1-3	1-3	2-5 depending on symptoms
Adenoids	2	2	1-2
Sinuses	1	1	1-3
Teeth	1-3	1-2	1-5 depending on symptoms
Tartar	1	1	1/2
Gums	1-3	1-3	1-5 depending on symptoms
Tongue	0	1	1/2-1 depending on cause
Breath	1	1	1/2-1 depending on cause
Hay Fever	0	0	1/2-1

The Circulatory System. The pulse is counted after sitting quietly for several minutes. If over 80, this is repeated twice on different days to rule out excitement. If still over 80, it is scored from 1 to 2 if the cause is functional; if organic, it is considered as a symptom of the organic lesion and is scored with this.

If the pulse does not return to normal within two minutes after exercise, the scoring is as above.

Blood pressure reading, if high or low, is repeated twice on different days. Blood pressure scoring is the same as in the Deaver and Hyde Park score sheets. *

Functional heart murmurs occur after rapid growth, during fatigue and periods of general debility. With rest and return to normal they should disappear. If present, the underlying cause should be investigated and corrected. They are not serious in themselves. Organic heart lesions, on the other hand, have a serious effect on general physical fitness and all activity must be greatly restricted. If the heart is, and continues to be, well compensated, there may be moderate activity, but when signs of decompensation appear it is evident that the bodily activity is a greater burden than the heart can carry. Enlargement of the heart and rapid pulse are part of the picture of organic heart disease and are not scored separately. All organic heart lesions are scored heavily if symptoms of decompensation are present, even up to 100, for heart disease is one of the chief reasons for restriction of activity.

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* See Appendix.

Table VII

Items in the Circulatory System

Comparison of Deaver, Hyde Park and Posse Scoring

Item	Deaver	Hyde Park	Posse
Pulse	1-2	1-3	1-3 depending on cause
Pulse-exercise	0	0	1-3 depending on cause
Blood pressure Within 15 of norm	1	1	1
Within 25 of norm	2	2	2
Within 35 of norm	3	3	3
Heart, functional	1-3	0	1-2
Heart, organic	1-3	1-3	5-100

The Respiratory System. The respiratory examination is not made during acute infections, therefore they are not scored. Persistent cough is investigated and scored according to diagnosis. Chronic bronchitis and asthma reduce the capacity for activity and are scored more than in the Deaver and Hyde Park score sheet. Recurrent pleurisy, generally accepted as tuberculous in origin, active tuberculosis and quiescent tuberculosis are contra-indications to physical activity and require an X-ray examination to determine the amount of involvement of lung tissue. They are scored heavily, even to 100. A history of empyema means careful examination, including fluoroscopic and X-ray pictures to ascertain the amount of functioning in the lung on the affected side. The scoring rests

squarely on the laboratory diagnosis.

Table VIII

Items in the Respiratory System

Comparison of Deaver, Hyde Park and Posse Scoring

Item	Deaver	Hyde Park	Posse
Cough	0	Under respira-	Score according to cause
Chr. Bronchitis	2	tory system	1-3
Asthma	0	scores 1-3	1-3
Recurrent pleurisy	2	on lung capac-	Score depends on
Tuberculosis active	3	ity. 1 for	X-ray and fluoro-
quiescent	3	less than 2	scopic examinations.
arrested	3	inches chest	Even to 100 in
Empyema	2	expansion.	serious organic cases.

The Abdomen, Kidneys and Bladder. Abdominal conditions fall under four headings, poor muscular support, ptosis of organs, enlarged liver and spleen, and tenderness. Poor support and ptosis are scored 1/2 to 1. Enlarged liver and spleen show serious organic conditions and are scored as part of the underlying cause. Tenderness, which also indicates some organic trouble, must be investigated as to cause and is scored 1 to 5 depending on the diagnosis.

Kidney and bladder trouble, indicated by pain, tenderness and variations from normal in urination and urine, are scored according

to diagnosis. Postural albuminuria is not serious and is scored under the postural defect. Chronic kidney trouble is a major cause of loss of physical fitness and is scored from 5 even to 100.

Hemorrhoids, fissures, fistula and bleeding from the rectum require investigation as to cause and are scored 1 to 3, depending on the diagnosis, and the amount of pain, bleeding and nervous irritability present.

Table IX

Items in the Abdomen, Kidneys and Bladder

Comparison of Deaver, Hyde Park and Posse Scoring

Item	Deaver	Hyde Park	Posse
Abdominal support	1	0	1/2-1
Ptosis	1	0	1/2-1
Liver	0	0	Score under
Spleen	0	0	underlying cause
Tenderness	1-3	1-3	1-5 depending on cause.
Kidneys	1-3	1-3	5-100
Rectum	2	2-3	1-3
Hernia	2-3	2-3	2-3

The Nervous System. Increase in the patellar reflex is often a part of the general nervous condition, and may be scored 1 to 3 to indicate a condition of nervous instability. Tremors, the Rhomberg sign and changes in gait, speech and reflexes indicate serious

organic lesions in the central nervous system. If present, which is rare at the age under consideration, score heavily.

Table X

Items in the Nervous System

Comparison of Deaver, Hyde Park and Posse Scoring

Item	Deaver	Hyde Park	Posse
Patellar reflex	3	1-3	1-3
Tremors, Rhomberg, Gait, Speech, Reflexes	3	3	5 up

The Endocrine System. Enlarged thyroid must be investigated as to type and scored accordingly. Adolescent thyroid without symptoms is not serious, if symptoms are present score 1 to 3. More serious thyroid conditions are scored 2 to 5. Deaver scores 1 to 3, Hyde Park 2 to 3.

The Skin, Lymphatics and Varicose Veins. Enlarged cervical, inguinal and axillary glands are grouped and scored with the cause - tonsils, teeth, tuberculosis.

Mild skin troubles are not serious. More severe conditions, such as marked acne, are scored 1 to 3 if there is an underlying cause, or if they affect the general condition.

Table XI

Items in the Skin, Lymphatics and Varicose Veins

Comparison of Deaver, Hyde Park and Posse Scoring

Item	Deaver	Hyde Park	Posse
Glands	2	2	Consider with underlying cause
Skin	1-2	1-3	1-3

The Menses. Menstrual irregularities are investigated as to cause. If there is pain, nausea and vomiting or marked debility, score 1 to 3.

General Condition and Endurance. Finally, if the individual seems to be in poor condition with loss of endurance and fitness without apparent cause, score 1 to 3 depending on the severity of the condition.

* * * * * *

Under the discussion of the scoring of the medical examination, there may be disagreement as to the values deducted for the different defects. This is a first attempt to assign values from the standpoint of effect on physical fitness and capacity to withstand the day's work. Doubtless many changes will have to be made as the system of scoring is further developed.

All medical histories were then scored and re-checked six

times with several days intervening to minimize the subjectivity. This was done during the school year while it was possible to compare the final score with the individual student. It may be noted that there were few changes from the first score, and while the correlation coefficient was not determined, it would probably be high and comparable to the Rogers's coefficient of .90 (22) on repeated examinations by the same physician.

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(22) Rogers, Frederick Rand. Administrative Measures in Physical Education. Newton, Mass., The Pleiades Press, 1932, p. 144.

Measurement of Physical Fitness

The physical fitness indices were determined by the Rogers's battery, for this is the most valid, objective and reliable of all present day tests of physical fitness. Its norms are well standardized and it has a reliability coefficient of .97.

A group from Boston University School of Education, under the personal supervision of Dr. Rogers, gave the tests. The gymnasium was so arranged that the students passed quickly from one test to another without loss of time. Other students who were unable to take the strength tests recorded the results on cards specially prepared for this purpose. The tests were completed in approximately one and a half hours.

Measurement of Intelligence

On three successive days the 30-minute Otis Self-Administering Tests of Mental Ability, Higher Examination, Form A was given to the three classes. The examining room was very quiet and care was taken to avoid any distraction of attention. One week later Higher Examination, Form C was given. Examination papers were exchanged and scored by the students. Each student then checked her own paper to obviate errors. All papers were finally re-checked by the examiner and averaged to obtain the final score. I.Q.'s were figured by

1. Adding to 100 the number of points the pupil's score exceeded the norm for her age.

2. Subtracting from 100 the number of points the pupil's

score fell below the norm for her age.

The norms used are found in the Otis Table IV, Age Norms in Higher Examination (30-Minute Limit).

Measurement of Scholastic Achievement

Scholastic achievement was determined by using the available marks in all academic courses. The marking system in this school is indicated in Table XII. To simplify the mathematics each letter was given a rating from 1 to 10. These were averaged out to two points, and the corresponding value in per cent assigned to the result.

Table XII

Marking System at Posse School

Letter	Rating	Per cent
A+	1	97-100
A	2	94-96
A-	3	90-93
B+	4	87-89
B	5	84-86
B-	6	80-83
C+	7	77-79
C	8	74-76
C-	9	70-73
D	10	69...

IV

ANALYSIS OF THE MEDICAL EXAMINATION AND THE PHYSICAL FITNESS INDEX

The question has often been raised of the relationship between the physical fitness index and physical fitness as diagnosed by the physician from the medical examination. One of the objectives of this study was the construction of a medical scoring system which would be a more accurate means of comparison between the two. Diagnosis of physical condition by the physician is subjective in nature and is based on ideal norms built up from years of experience in examining school children. There are no thoroughly reliable statistical norms for the medical examination. Blood pressure, height, weight age relationship, pulse-exercise reaction and posture have partial norms which are fairly reliable, but they have not been reduced to statistical figures. In constructing the score sheet used in this study, all defects, whether functional or organic, were scored from the standpoint of estimated effect on present physical fitness. The judging of the effect of functional defects is very difficult. All such judgement is largely subjective, but the subjectivity is minimized somewhat by long years of experience, and also by being able to follow up the students over a period of time.

The scores from the medical examinations at Posse were

high. The reason for this is apparent, for these girls are a highly selected group, physically. Serious functional and organic defects are a contra-indication to the strenuous activity in a School of Physical Education. The medical examination showed few defects in any one individual, and these were largely minor functional ones and a few minor organic. On the other hand, medical examinations in regular school systems and colleges often bring to light many organic lesions, some of them very serious.

The medical examination showed nineteen girls in nearly perfect condition, seven scoring 100 and twelve 99. There were thirty-seven with a high average condition, scoring 98. Three pupils scored 97 and one 96. It is interesting to note that the girls with the medical rank of 98 had P.F.I.'s of 106, 89 and 79 respectively, and the one with 96 a P.F.I. of 76.

The following table lists the defects found and their distribution.

Table XIII

Distribution of Functional and Organic Defects

Constipation	13	Deviated septum	13
Frequent colds	20	Catarrh	2
Sore throats	7	Tonsils	6
Headaches	14	Glands, cervical	2
Overweight	20	Breath	1
Musculature	2	Teeth	3

Table XIII (continued)

Distribution of Functional and Organic Defects

Posture	11	Blood pressure	7
Vertebrae, slight stiffness of lumbar	1	low	6
Feet		high	1
slight pronation	50	Cough, chronic	1
with pain	2	Abdominal pain	1
joint	1	Reflexes, patellar increased	8
Athlete's foot	1	Acne	8
Hearing	2	Menstrual difficulties	22

The most serious of these conditions are two cases of severe foot strain requiring orthopedic care; one case of chronic cough, cause undetermined; six cases of overweight; four cases of severe menstrual pain; and two cases of enlarged tonsils with symptoms of absorption. A large per cent of the other conditions can be easily improved or corrected.

While the physical fitness test is not proposed as a substitute for the medical examination, it supplements it strongly in indicating both bodily fitness and unfitness. A low P.F.I. means unfitness, for which the medical examination shows no cause in many instances. When a thorough medical examination follows, with laboratory and X-ray examinations if necessary, the defect causing the low P.F.I. is found in a large per cent of the cases. It would seem

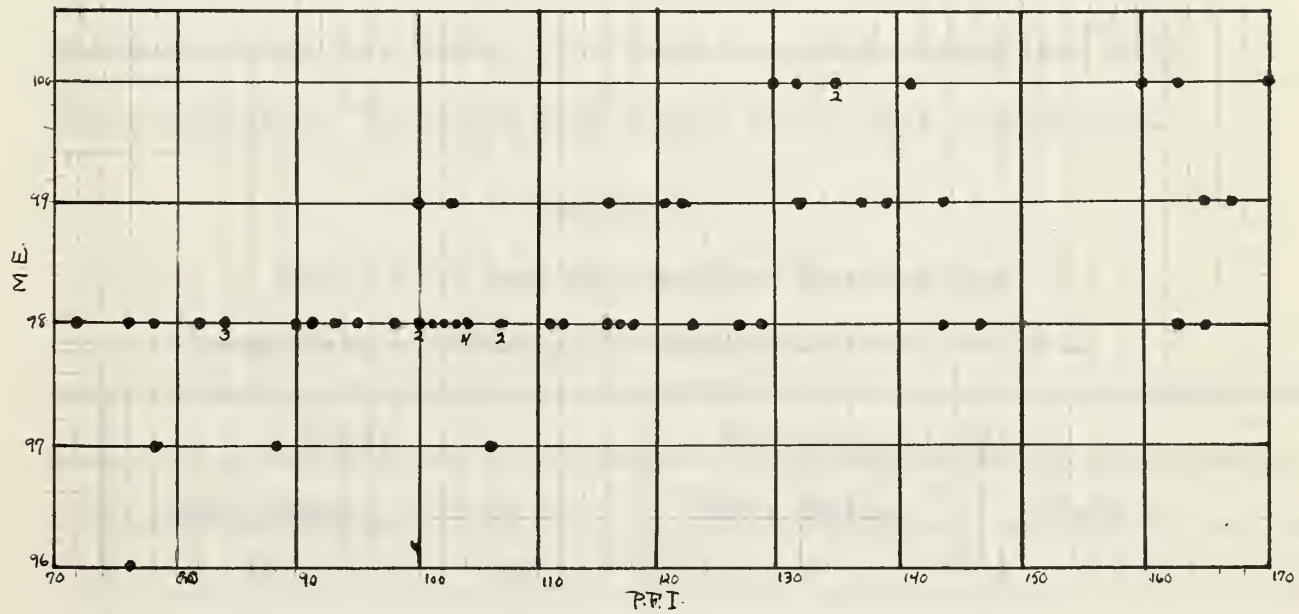
that the P.F.I. test is a more accurate and delicate measure of physical condition than is the routine school medical examination. (23) (24) (25)

The following chart shows a scattergram of the P.F.I. and the medical examination.

Chart I

Scattergram of the P.F.I. and the

Medical Examination



(23) Zimmerli, Elizabeth. Case Studies of Unusual Physical Fitness Indices. Supplement to The Research Quarterly of the American Physical Education Association, Vol. VI, No. 1, March 1935, pps. 244-249.

(24) Rogers, Frederick Rand. The Significance of Strength Tests in Revealing Physical Condition. The Research Quarterly of the American Physical Education Association, Vol. V, No. 3, October 1934, pps. 43-46.

(25) Rogers, Frederick Rand. Fundamental Administrative Measures in Physical Education. Newton, Mass., The Pleiades Press, 1932, pps. 125-127, 227-229.

The correlation coefficient between the medical examination and the physical fitness index in this study, computed by the Pearson Product-Moment Formula, is plus..63, with a predictive index of .224. Chamberlain and Smiley found a correlation of plus .60 in their study on sixty-five Cornell men, but the method of rating the P.F.I. and the medical examination was obtained in a different way (26) in the latter study.

At this point the results of the Posse medical examination and P.F.I. test were analyzed to correspond to the Chamberlain-Smiley study, for more accurate comparison with their figures. The following table shows this comparison.

Table XIV

The P.F.I. and the Medical Examination

Comparison of Posse and Chamberlain-Smiley Data

	Posse		Chamberlain-Smiley	
	Med. Exam.	P.F.I.	Med. Exam.	P.F.I.
A	19	24	5	7
B	37	31	41	42
C	4	5	19	16

The Posse correlation coefficient from Table XIV, computed by the Pearson Product-Moment Formula, is plus .75, with a predictive index of .339. The Chamberlain-Smiley coefficient, computed by the standard product-moment formula is plus .60.

(26) See this Thesis, pps. 6-8.

In the following table is shown the agreement between the P.F.I. and the medical examination for the two studies.

Table XV

Agreement between the P.F.I. and the Medical Rating

Comparison of Posse and Chamberlain-Smiley Data

	Posse		Chamberlain-Smiley	
Class	Numbers	Agreement	Numbers	Agreement
Superior	16 out of 19	.84	3 out of 5	.40
Average	26 out of 37	.70	36 out of 42	.857
Inferior	2 out of 5	.40	13 out of 19	.68
Total	44 out of 60	.73	52 out of 65	.80

The fifteen point difference in the correlation coefficient from these two studies is easily explained by the fact that students in a School of Physical Education are a very highly selected group from the viewpoint of physical fitness.

V

ANALYSIS OF THE P.F.I. AND THE I.Q.

The physical fitness indices range from 72 to 170 with a median of 109. Students with a P.F.I. twenty per cent or more above the norm for the age and weight are considered as superior in physical fitness, and those twenty per cent or more below the norm for the age and weight are considered inferior or handicapped. All between these two limits are of normal or average physical fitness. The grouping according to this classification is:

120 and above.....superior.....24

80 to 119.....average.....31

79 and below.....inferior..... 5

The highest score of 170 was made by a girl of 19 years and 5 months, only 100.5 pounds in weight and 59.5 inches in height. Her strength index was 1572 and the norm for her age and weight 924. She is a tiny, muscular little person with bow-legs, very active, in splendid physical condition, a fairly good athlete, and an excellent performer on the trumpet. It is a little astonishing that she should outrank so many other girls of much better build, who excel as all around athletes.

An analysis of the five cases falling below a P.F.I. of 80 and classified as inferior follows. These girls carry a complete school program without signs of fatigue and do not

appear to be inferior.

Case 1. The cause of this P.F.I. of 79 is probably marked overweight, with some general debility, very likely of endocrine origin. The following defects were found on the medical examination, overweight 35.5 pounds, musculature fair, slight right deviation of nasal septum, blood pressure 100/64 and a history of headache.

Case 2. A very recent, acute grippe cold may be the cause of this P.F.I. of 78. This girl should have a higher P.F.I. Few defects were found on the medical examination, overweight 13 pounds, musculature fairly good and slight acne.

Case 3. This girl has a moderately severe chronic cough, is pale and tires easily. This probably accounts for her P.F.I. of 76. The defects found were overweight 15 pounds, left tonsil one plus, history of some sore throat, history of frequent colds and a chronic cough. No cause was found for this cough.

Case 4. This girl is fat and flabby looking. Her P.F.I. was 75. The medical examination showed the following slight defects, overweight 21.5 pounds, musculature fairly good and a history of some headache.

Case 5. A severe intestinal influenza during the late summer, with debility persisting until Christmas, without doubt accounts for the P.F.I. of 72, the lowest in the school. The defects found were overweight 16 pounds, history of frequent colds, sore throat and headache.

The following table shows the P.F.I. distribution with the corresponding I.Q.'s.

Table XVI

P.F.I.'s and Corresponding I.Q.'s

No.	P.F.I.	I.Q.	No.	P.F.I.	I.Q.	No.	P.F.I.	I.Q.
1	170	103	21	127	108	41	102	97
2	165	119	22	123	106	42	101	102
3	165	97	23	122	92	43	100	110
4	163	106	24	121	108	44	100	115
5	163	114	25	118	102	45	100	93
6	163	111	26	117	119	46	98	110
7	160	104	27	116	114	47	95	114
8	150	102	28	116	110	48	93	118
9	146	102	29	112	103	49	91	99
10	143	118	30	111	97	50	90	101
11	143	99	31	107	106	51	89	122
12	141	115	32	106	113	52	83	118
13	139	97	33	106	97	53	83	105
14	137	105	34	106	105	54	83	102
15	135	112	35	104	93	55	82	93
16	135	122	36	104	112	56	79	114
17	132	101	37	104	117	57	78	103
18	132	104	38	104	102	58	76	93
19	130	117	39	103	96	59	75	104
20	129	121	40	103	113	60	72	95

The correlation between the P.F.I. and the I.Q. is plus .04. The predictive index is .001. Only two studies have been found showing the correlation between these two variables, one by Giauque (27) gives a correlation of minus .25, and one by

(27) Giauque, Charles D. An Inquiry into the Correlation between Physical Fitness and Scholastic Standing. Supplement to The Research Quarterly of the American Physical Education Association, Vol. VI, No. 1, March 1935, p. 271.

Rogers (28) minus .07 and minus .10. The Posse correlation, while extremely low, is positive, and is 29 points higher than the Giauque figures, and 11 and 14 points higher than those reported by Rogers. This may be explained by the fact that the girls in this study are a highly selected group, both as to physical fitness and mental ability.

Ordinarily it is not considered that the I.Q. is improvable, while the P.F.I. shows the effect of even slight changes in physical conditions. There seems to be considerable disagreement as to just what the relationship between the two variables is and there is some question as to its importance. At the present time it seems to be of questionable value both to physical educators and to educators in general.

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(28) Rogers, Frederick Rand. Fundamental Administrative Measures in Physical Education. Newton, Mass., Pleiades Press, 1932, p. 246.

VI

ANALYSIS OF THE P.F.I. AND THE SCHOLASTIC ACHIEVEMENT

The scholastic achievement is discussed in Chapter VII and the physical fitness in Chapters IV and V.

The following table gives the physical fitness indices and their corresponding scholastic marks.

Table XVII

P.F.I.'s and Corresponding Scholastic Marks

No.	P.F.I.	Marks	No.	P.F.I.	Marks	No.	P.F.I.	Marks
1	170	87	21	127	97	41	102	84
2	165	94	22	123	91	42	101	93
3	165	87	23	122	85	43	100	80
4	163	88	24	121	91	44	100	97
5	163	92	25	118	80	45	100	88
6	163	78	26	117	95	46	98	87
7	160	88	27	116	92	47	95	95
8	150	85	28	116	94	48	93	94
9	146	91	29	112	90	49	91	82
10	143	92	30	111	80	50	90	88
11	143	86	31	107	85	51	89	94
12	141	88	32	106	82	52	83	85
13	139	90	33	106	82	53	83	82
14	137	88	34	106	88	54	83	85
15	135	89	35	104	88	55	82	84
16	135	95	36	104	87	56	79	84
17	132	84	37	104	92	57	78	84
18	132	82	38	104	90	58	76	82
19	130	92	39	103	90	59	75	85
20	129	97	40	103	87	60	72	85

The correlation coefficient between these two variables,

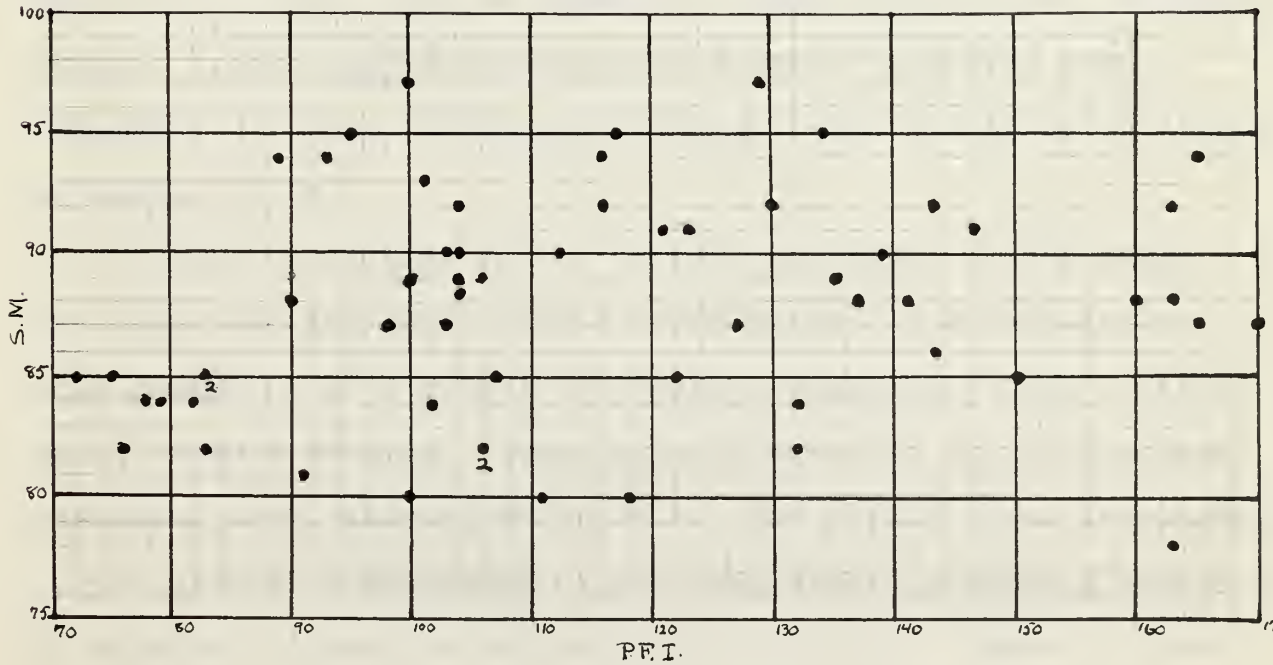
computed by the Pearson Product-Moment Formula, is plus .10, with a predictive index of .005.

This correlation of plus .10 between the physical fitness index and the scholastic achievement agrees with the result obtained by Giauque (29) in his study of the Lynbrook High School boys. It is probable that there is a closer relationship between the two than this low correlation indicates.

Chart II

Scattergram of the P.F.I. and

the Scholastic Marks



(29) Giauque, Charles D. An Inquiry into the Correlation between Physical Fitness and Scholastic Standing. Supplement to The Research Quarterly of the American Physical Education Association, Vol. VI, No. 1, March 1935, pps. 269-275.

If we had an accurate method of measuring mental achievement and if pupils accomplished the highest degree of mental work of which they are capable, the correlation between physical fitness and scholastic marks should more nearly approximate its true relationship.

It is reasonable to assume that physical fitness influences mental activity to a marked degree. Any acute illness, which decreases physical fitness, has a corresponding effect on the mind, the more severe the illness, the lower the physical fitness and the capacity for mental work. Even a simple headache decreases thinking and reasoning power. On the other hand, many local conditions, such as paralysis caused by anterior poliomyelitis or broken leg, which markedly restrict activity with a resulting decrease in physical fitness, have little or no effect on mental powers.

There is another factor in this particular study which may have some influence on the correlation. The students of this group are in a School of Physical Education, with a difficult, crowded program. Their main interest is in the practical gymnasium work, dancing and sports. The result is an improvement in the general musculature of the body with a resulting increase in physical fitness as indicated by the P.F.I. There is less time for study and less interest in it. This means that the scholastic achievement for the majority is somewhat lower than it might be under a different program.

Since the reliability of the physical fitness index (.97)

is fully established and the unreliability of teachers' marks is well known, and since there are many factors other than intelligence which effect scholarship, this low correlation figure is partly explained.

It has been stated above that it is reasonable to assume that there is a positive correlation between physical fitness and mental achievement, but there are other factors involved, among which are interest or dis-interest in studies, application to work, pride in accomplishment, nationality, attitude of the parents and extra-curricular activities. Considering all these factors it is possible that present methods of correlation may show that the relationship between physical fitness and scholastic achievement is a low one, and therefore practically valueless to educators.

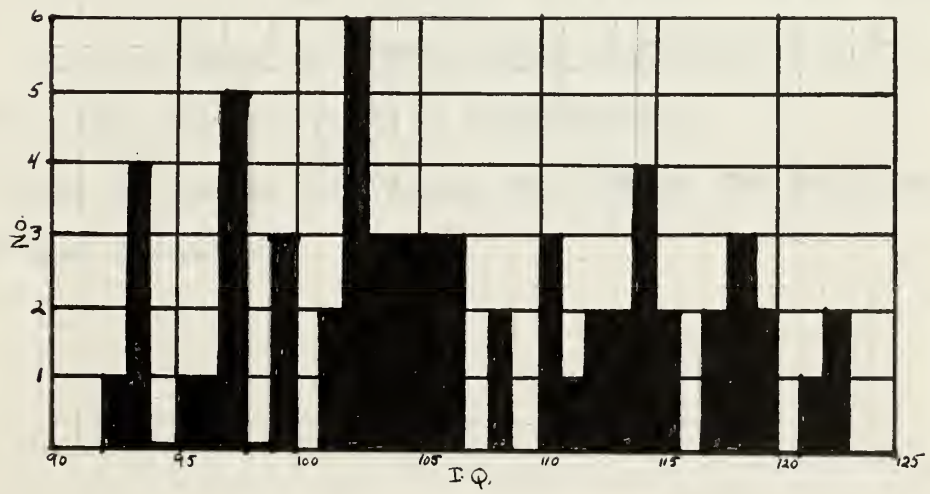
VII

ANALYSIS OF THE I.Q. AND THE SCHOLASTIC ACHIEVEMENT

The mental ability of the girls at this school is high, the large majority having been in the upper third of their class during their high school course. The following chart shows the I.Q. frequency.

Chart III

The I.Q. Frequency



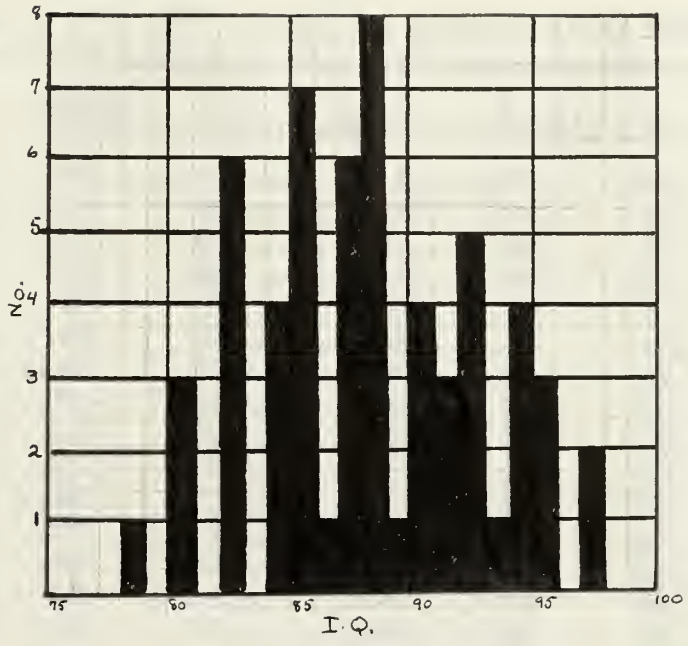
The I.Q.'s ranged from 122 to 92, forty-six being over 100 and fourteen a little below 100, but within the limit of normal intelligence. The mid-score is 105 and the median 106.25.

The scholastic achievement, a chart which follows, also indicates a high degree of mental ability. These marks range from one at 78 to 97, with a mid-score of 88 and a median of 88.26. While the marking system is largely subjective, it is interesting to note how closely our instructors agree in judging the mental ability of the individual students. This is particularly true of the two upper classes. The marks of the Freshmen are probably not quite so accurate a measure of their scholastic ability, for this youngest class must make many adjustments during its first year. The physical education course is difficult and technical, very different from all previous studies. There is little chance for close supervision of study and there are so many outside interests that it takes about a year for the new students to adjust and do their best work. It would seem that this might influence both the scholastic marks and the correlation coefficient.

Chart IV on the following page shows The Scholastic Achievement Frequency.

Chart IV

The Scholastic Achievement Frequency



The following table gives the I.Q. figures with the corresponding scholarship marks for the sixty students.

Table XVIII

I.Q.'s and Corresponding Scholarship Marks

No.	I.Q.	Marks	No.	I.Q.	Marks	No.	I.Q.	Marks
1	122	95	21	111	78	41	102	90
2	122	94	22	110	94	42	102	85
3	121	97	23	110	80	43	102	91
4	119	94	24	110	87	44	102	80
5	119	95	25	108	91	45	101	88
6	118	85	26	108	87	46	101	84
7	118	92	27	106	88	47	99	86
8	118	94	28	106	91	48	99	82
9	117	92	29	106	85	49	97	84
10	117	92	30	105	88	50	97	80
11	115	88	31	105	88	51	97	87
12	115	97	32	105	82	52	97	82
13	114	95	33	104	82	53	97	90
14	114	92	34	104	85	54	96	90
15	114	92	35	104	88	55	95	85
16	114	84	36	103	87	56	93	88
17	113	82	37	103	90	57	93	82
18	113	87	38	103	84	58	93	88
19	112	89	39	102	93	59	93	84
20	112	87	40	102	85	60	92	85

Analyzing the scholastic marks of the highest fifteen I.Q.'s, the 75 percentile, we find that there are thirteen honor students with ranks from 92 to 97. These students, besides having a high degree of intelligence apply themselves diligently to their work. In this group are two students, ranking 85 and 88, who are equally intelligent and quite capable of ranking in the nineties, but they lack the ability of application and both have too many extra-curricular interests. In the fifty percentile there are six honor students, and in the twenty-five percentile group there

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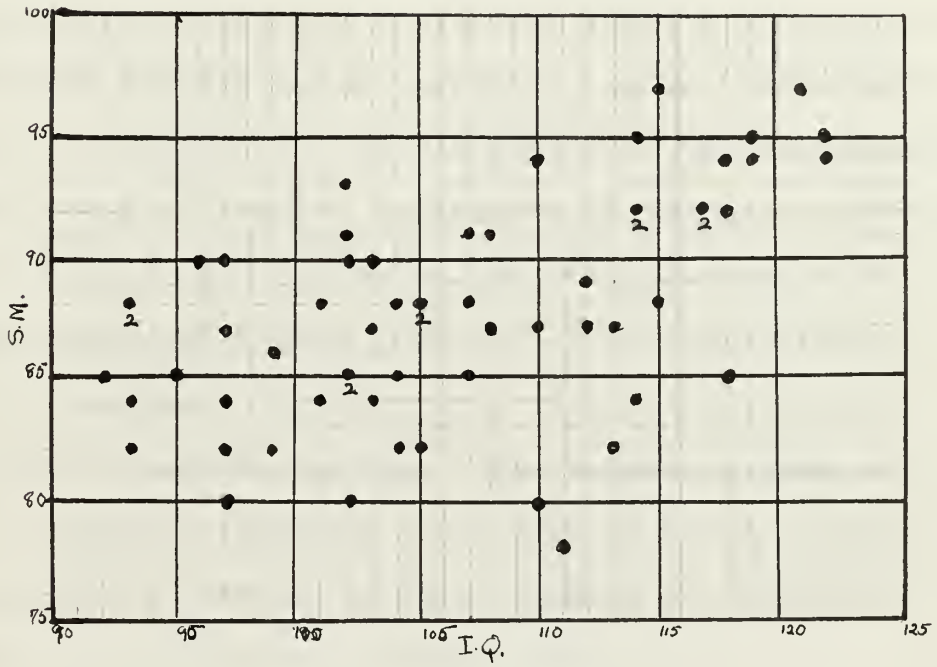
School of Education
Library

are two. All of these eight are also faithful student.

Chart V

Scattergram of the I.Q. and Scholastic Marks



The correlation coefficient between the I.Q. and the scholarship achievement is plus .46. The predictive index is .112. The mean of like correlations * , where the number of cases is exactly known, is .476 with a range from .31 to .66. The Flemming figures * show a correlation of .52 for the Horace Mann Junior High School, and one of .319 for the Senior High School. Thus the Posse correlation corresponds very closely

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* See this Thesis, p. 11.

with the figures from similar studies.

Undoubtedly there would be a much closer correlation, given that ideal condition of students accomplishing the highest degree of mental work of which they are capable, and an accurate measurement for their accomplishment. Unfortunately, however, there are many other factors which make this unattainable for the large majority. Among these factors are lack of interest in certain subjects, varying degrees of industry and application, variations in physical condition, lack of pride in accomplishing the best possible work, and too many extra-curricular interests. The unreliability of subjective methods of measuring student achievement is too well known to need discussion. The marking system at this school is largely subjective and must be freed of all possible subjectivity, if the correlation between the scholastic marks and the I.Q. is to be an accurate one.

VIII

CONCLUSIONS

The conclusions, pertinent to the data from this study of sixty girls at the Posse School of Physical Education, are:

1. The accurate, mathematical rating of physical fitness as indicated by the medical examination is impossible at the present time, due to the lack of medical norms and the subjectivity of the medical examination, and such a mathematical rating will remain inaccurate until statistical norms are constructed on all points in the medical examination for all the different bodily types.

2. The correlation coefficient between the medical examination and the physical fitness index agrees with that obtained in other studies and it clearly indicates that an accurate, statistical comparison of the two can not be made until medical norms have been established.

3. The correlation coefficient between physical fitness and intelligence was found to be positive, but it was so low (.04) that it is of no value to educators interested in improving teaching techniques and scholarship.

4. This is also true of the correlation coefficient (.10) between the physical fitness index and scholastic achievement. Although it has not been definitely proven, it is reasonable to say that there is a physiological relation-

ship between physical fitness and mental activity, but scholarship is influenced by so many other factors * that present methods of correlation seem inadequate in showing the true relationship.

(*) See this Thesis, pps. 12 and 47.

IX

RECOMMENDATIONS

The following recommendations are made as a result of this study:

1. Further study should be made to establish statistical medical norms on all points in the medical examination for the different bodily types. A brief outline for such a study is herewith presented, and it is suggested:

a. That the superintendent of schools, the chief medical examiner and the head of the physical education department of some school system be shown the need for such a study and their cooperation obtained in making it.

b. That a small group of physicians, thoroughly trained in routine school examining and also in physical education, be instructed in the special methods of interpretation necessary for this study.

c. That the students be classified into bodily types corresponding to those generally accepted by the medical profession.

d. That the school examinations be recorded on a card specially constructed for this study, with full notes as to the general condition and the effect of functional and organic defects on the general physical fitness.

e. That the estimate of general physical fitness be obtained from class room and physical education teachers to help to insure accuracy in forming judgement on this point.

f. That the P.F.I. test be made on all pupils, under the supervision of the head of the physical education department, unless contra-indicated by the medical examination.

g. That a careful comparison be made of physical fitness as indicated by the medical examination and the P.F.I. test, and that all pupils with a low P.F.I. be re-examined to find the cause.

h. That a careful analysis of the results of the medical examination be made, with re-examination of all doubtful cases.

i. That statistical norms be constructed for all points in the medical examination for all bodily types of individuals.

From the results of this study it is evident that changes must be made in the measurement program at the Posse School of Physical Education, and it is recommended:

1. That study be continued on the question of accurately scoring the medical examination from the standpoint of general physical fitness.

2. That the measurement of student's scholastic achievement be made, as far as possible, by accurately constructed objective

tests, and that a closer supervision of individual effort be made, with frequent discussions by the teaching staff, and personal interviews with the students.

3. That the physical fitness tests be administered several times during the year, and that the relationship between the physical fitness, scholarship and the medical examination be more carefully analyzed.

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CHAPTER X

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APPENDIX

CHAPTER XI

MEDICAL EXAMINATION FORMS USED AT POSSE SCHOOL OF PHYSICAL EDUCATION

THE MEDICAL HISTORY

Name.....Date.....

Class.....Age.....

FAMILY HISTORY

Family	Age if living	Health	Age at death	Cause
Father				
Mother				
Brothers				
Sisters				

Family history of pulmonary, circulatory or kidney disease, syphilis, diabetes or cancer?.....

.....

PERSONAL HISTORY

How many hours do you sleep?.....Sleep well?.....

Do you use tobacco?.....How much per day?.....

How many cups of tea or coffee per day?.....

Check the following diseases you have had and state at what age.

Mumps.....Infantile Paralysis.....

Measles.....Smallpox.....

Whooping Cough.....Otitis Media.....

German Measles.....Bronchitis.....

Chicken-pox.....Pneumonia.....

Diphtheria.....Tuberculosis.....

Scarlet Fever.....Pyelitis.....

Tonsillitis.....Asthma.....

Chorea.....Hay Fever.....

Acute Rheumatic Fever.....Hives.....

Typhoid.....Eczema.....

Other illnesses.....

Operations.....

Accidents.....

PRESENT--MEDICAL HISTORY

Are your appetite and digestion good?.....

Subject to constipation?.....

Diarrhea?.....Hemorrhoids?.....

Frequent colds?.....Sore throats?.....

Cough?.....Vertigo?.....

Headaches?.....

Do you faint? Why?.....

Emotional disturbances?.....

Subject to nervousness?.....

Kidney Trouble?.....Bladder trouble?.....

SUMMARY.....

.....

.....

.....

.....

PHYSICAL EXAMINATION

Name.....Age.....

Height.....Weight.....Weight norm.....

Maximum weight.....When.....

Recent gain.....Recent loss.....

Cause.....Vital capacity.....

POSTURE AND FEET

Posture standing.....Kyphosis.....

Lordosis.....Scoliosis.....

Shoulders, Right.....Left.....

Posture picture.....

Longitudinal arch.....Transverse arch.....

Pronation.....Pain in feet.....

Pain in back of legs.....Knock-knee.....

Bow-legs.....Calluses.....

Hammer-toe.....Hallux valgus.....

Overriding toes.....Corns.....

Athlete's foot.....Swollen joints.....

Shoes, correct or incorrect.....

SUMMARY.....

.....

.....

.....

.....

.....

MEDICAL EXAMINATION

Name.....Class.....Date.....

EYES

Distant vision: Right.....Left.....

Near vision: Right.....Left.....

Field of vision.....Muscle balance.....

Pupils.....Reaction to l. and d.....

Glasses.....Last fitted.....

Conjunctiva.....Eyelids.....

Astigmatism.....Other trouble.....

EARS

Hearing: Right.....Left.....

Canal: Right.....Left.....

Drums: Right.....Left.....

History of ear trouble.....

NOSE AND THROAT

Septum.....Sinuses.....

Pharynx.....Larynx.....

Tonsils removed.....Tags.....

Enlarged.....Buried.....

Cryptic.....Contain pus.....

History of throat trouble.....

Adenoids.....Frequent colds.....

Glands.....Catarrh.....

Asthma.....Hay fever.....

Breath.....

TEETH.....GUMS.....

Carious..... Receding.....

Fillings..... Bleeding.....

Roots..... Infected.....

Capped or crowned..... Anemic.....

Missing.....TONGUE.....

Tartar.....X-rayed when.....

Occlusion.....X-ray diagnosis.....

.....X-ray advised.....

CHART OF THE TEETH

... ...
... ...
. .
... ...
... ...

CIRCULATORY SYSTEM

History of circulatory disease.....

Apex.....

Enlargement: None.....Slight.....Moderate.....Marked.....

Apex sounds: Clear....Muffled....Distant....Accentuated.....

Murmurs.....

Pulse: Sitting after quiet period.....After exercise.....

60 seconds after exercise.....90 seconds.....

Pulse regularity.....Quality.....

Blood pressure: Systolic.....Diastolic.....

Pulse pressure.....

Hemoglobin.....

RESPIRATORY SYSTEM

Shape of chest: Normal....Pigeon....Barrel.....Funnel.....

Inspection.....

Palpation. Fremitus: Normal..Absent..Decreased..Increased...

Persussion. Resonance: Normal.....Diminished.....Dull.....

Flat.....Hyperresonant.....

Auscultation. Breath sounds: Normal....Absent....Distant....

Bronchovesicular....Bronchial.....Amphoric.....Rales.....

Location of abnormal breath sounds.....

.....

History of respiratory disease.....

.....

ABDOMEN.

Shape: Normal....Scaphoid.....Protruding.....Pendulous.....

Tenderness.....Location.....

Liver.....Spleen.....

Stomach.....Appendix.....

Hernia.....

History of abdominal disease.....

Operations.....

BRAIN AND NERVOUS SYSTEM

Patellar reflex: Normal.....Absent.....Increased.....

Tremors.....Gait.....

Speech.....Rhomberg sign.....

History of nervousness.....

History of psychoses.....

ENDOCRINE SYSTEM

Thyroid.....

Basal metabolism.....

Other signs of endocrine trouble.....

.....

SKIN, LYMPHATICS, VEINS

Color.....Dry.....

Warts.....Moles.....

Acne.....

Other disorders.....

Lymph glands.....

Varicose veins.....

KIDNEYS AND BLADDER

History of kidney trouble.....

History of bladder trouble.....

Urination: Frequency: Day.....Night.....Painful.....

Urinalysis: Sp. gr.....Reaction.....Albumen.....

Sugar.....Casts.....

RECTUM

Hemorrhoids.....Fissures.....

Fistula.....Bleeding.....

MENSES

Age of establishment of menses.....

Regularity.....Number of days.....

Amount of flow.....Pain.....

Out of class.....Bed.....

Other symptoms.....Operations.....

THE POSSE SCORE SHEET

1. THE FAMILY HISTORY

The Family History is not scored, inasmuch as defects which are inherited are scored under the medical examination proper.

2. THE PERSONAL HISTORY

Past diseases.

Defects remaining from previous diseases are scored under the medical examination proper.

Hygienic habits.

Poor hygienic habits are scored according to the effect on physical fitness.

Sleep. Score 1/2 to 1 depending on effect

Tobacco. Score 1 if any effect

Tea, coffee. Score 1/2 to 1 if used in excess

Indigestion. Score 1/2 to 1 depending on severity

Constipation. Score 1/2 to 1 depending on symptoms.

Vaccination

Vaccination, having no effect on physical fitness, is not scored.

3. THE PHYSICAL EXAMINATION

Age, height, weight

For finding the normal weight for age and height, use the Age, Height, Weight Tables for Women compiled by the Association of Life Insurance Directors and the

Actuarial Society of America. The scoring tables follow:

Light Weight	Medium Weight
0 equals 5% below normal	0 equals 5% from normal
1 equals 10% below normal	1 equals 10% from normal
2 equals 15% below normal	2 equals 15% from normal
3 equals 20% below normal	3 equals 20% from normal

Heavy Weight

0 equals 10% above normal
2 equals 15% above normal
3 equals 20% above normal
5 equals 25% above normal

Musculature. Score 1 to 2.

Vital capacity is scored under the P.F.I. test.

Posture.

Use the Harvard Posture Charts and the angle measurement norms of Goldthwaite in judging posture.

Score posture only if very poor, or if there are symptoms of fatigue, eye strain, muscular strain or pressure on internal organs.

Score 1/2 to 1.

Kyphosis, lordosis, scoliosis.

Score organic types 1 to 5, depending on the severity of the condition, symptoms and amount of rigidity.

Bow-legs, knock-knee.

Score 1/2 if marked degree.

Feet.

Consider the foot condition as a whole. The scoring depends on the amount of pain, rigidity and debility.

Score 1 to 3.

4. THE MEDICAL EXAMINATION

Eyes

Vision, distant. Score 1/2 to 1, depending on degree.

Vision, near. Score 1/2 to 1, depending on degree.

Astigmatism. Score 1/2 to 1, depending on degree.

Other eye conditions are scored according to the cause. Score 2 to 5.

Ears

Hearing. Score 1/2 to 1.

Nose, throat, mouth

Deviated septum. Score 1/2 to 2.

Pharynx. Score 1/2 for congestion or catarrhal condition.

Larynx. Score 1/2 to 1 for husky voice.

Tonsils. Score 2 to 5, depending on symptoms.

Adenoids. Score 1 to 2.

Sinuses. Score 1 to 3, depending on symptoms.

Teeth. Score 1 to 5, depending on local condition and general symptoms.

Tartar. Score 1/2.

Gums. Score 1 to 5, depending on local condition and general symptoms.

Tongue. Score 1/2 to 1, depending on cause.

Breath. Score 1/2 to 1, depending on cause.

Hay Fever. Score 1/2 to 1, depending on severity.

The Circulatory System

Pulse. Rapid pulse of over 80 is scored 1 to 3, depending on rate and cause. If due to organic heart disease, it is scored under the heart.

Pulse-exercise reaction. If pulse does not return to normal within two minutes, score 1 to 3, or under heart as above.

Blood pressure. Use the following chart in figuring normal blood pressure.

Age	Systolic	Diastolic	Pulse Pressure
20	120	79	41
30	122	81	41
40	129	83	42
50	129	85	44
60	134	87	47
All ages	121	81	43

Pulse pressure. If over 50 add 1 to blood pressure score.

Functional heart. Score 1 to 2 depending on symptoms and cause.

Organic heart. Score from 5 even to 100, depending on severity of pathology and symptoms of decompensation.

The Respiratory System

Cough. Score under condition causing the same.

Chronic bronchitis. Score 1 to 3, depending on severity.

Asthma. Score 1 to 3, depending on severity.

Respiratory System (continued)

Pleurisy, recurrent. Score heavily as this condition is ordinarily tuberculous.

Tuberculosis

Active
Quiescent
Arrested

Score these four items heavily, even to 100. The scoring depends on the extent of the pathology and the effect on physical fitness.

Abdomen

Poor abdominal support. Score 1/2 to 1.

Ptosis of organs. Score 1/2 to 1.

Liver and spleen. The score depends on the diagnosis. As pathology in these organs is serious, score heavily.

Tenderness. Score 1 to 5, depending on cause.

The Nervous System

Patellar reflex increased. If due to general condition and not to disease of the nervous system, score 1 to 3.

Tremors
Rhomberg sign
Gait
Speech
Reflexes

These are all symptoms of pathology in the central nervous system. Score from 5 up, depending on the severity of the symptoms and amount of pathology.

The Endocrine System

Adolescent thyroid. Score 1 to 3, depending on symptoms.

Thyroid, organic. Score 2 to 5, depending on type and symptoms.

Skin, Lymphatics, Varicose veins

Skin conditions, as acne, score 1 to 3.

Enlarged glands. Score under underlying condition.

Kidneys, Bladder

Orthostatic albuminuria is scored as part of the postural condition which causes it.

Organic kidney trouble is scored from 5 even to 100, depending on the pathology and its effect on the physical fitness.

Rectum

Hemorrhoids, fissures, fistula and bleeding are scored 1 to 3, depending on the diagnosis, amount of pain and bleeding, and degree of nervous irritability.

Menses. Score 1 to 3, depending on severity of the symptoms.

General Condition and Endurance. Score 1 to 3, depending on amount, if no cause can be found for the same.

THE DEAVER SCORE SHEET *

1. Muscular development.

Excellent-0, good-1/2, average-1, poor-2, very poor-3.

2. Weight, height, age.

Use chart to find normal weight for age and height.

Light Weight	Medium Weight
0 equals 5% below normal	0 equals 5% from normal
1 equals 10% below normal	1 equals 10% from normal
2 equals 15% below normal	2 equals 15% from normal
3 equals 20% below normal	3 equals 20% from normal

Heavy Weight

0 equals 10% above normal
1 equals 15% above normal
2 equals 20% above normal
3 equals 25% above normal.

3. Vital capacity.

Use chart to find normal vital capacity for body weight.

0 equals 85% or better
1 equals 75% to 84%
2 equals 65% to 74%
3 equals below 65%

4. Posture.

A-0, B-1, C-2, D-3.

5. Spine-scoliosis.

1-2-3 depending on severity of deformity
Flexible curve score 1 or 2
Rigid curve score 3.

6. Legs.

Bow-legs-1/2, Knock-knee-1/2.

(*) Deaver, Dr. G. G. Motivating Physical Examinations. Chicago, Ill., The Y.M.C.A. Press.

7. Feet-depressed longitudinal arch.

0-normal
1-pronation, no pain
2-flatfoot or pronation with pain in foot or calf
3-flatfoot ot pronation with pain and rigidity of bones.

Feet-depressed transverse arch.

1-depressed transverse arch, pain walking
2-depressed transverse arch, pain and callus on sole of foot
3-condition present in both feet, difficulty in walking.

8. Toes.

The condition of the toes-hallux valgus, corns, bunion, toe itch (athlete's foot), etc.

1-2-3 depending on severity.

9. Joints.

1-synovitis with weak joint when used in physical activity
2-synovitis, pain on motion, pain with exercise
3-arthritis in many joints.

10. Distant vision. Deduct score for each eye.

0-normal vision 20/20
1/2-vision 20/30
1-vision 20/40
1 1/2-vision 20/60
1-vision corrected by glasses.

11. Near vision. Deduct score for each eye.

0-if smallest type can be read by each eye at 14 inches
1/2-for each larger type.

12. Test for form.

3-for any definite diminution in the field of vision.

13. Pupils.

0-normal
3-irregular or do not react to light-Argyll Robertson pupil.

14. Color vision.

2-if color blindness is present.

15. Astigmatism.

2-astigmatism, symptoms of eye strain, headaches
1-if corrected by glasses.

16. Muscle balance.

1/2-heterophobia corrected by glasses
1-heterophobia
2-esophoria-both eyes rotate inward
2-exophoria-both eyes rotate outward
2-strabismus-one eye deviates (cross-eyed).

17. External affections.

1-all acute infections
2-chronic inflammation of moderate degree
3-chronic infection of severe degree.

18. Media.

Conjunctiva. Score 1-2-3 depending on severity and degree
Cornea. Score 3 for corneal ulcers, keratitis
Iris. Score 2 for iritis
Lens. Score 1-2-3 for cataract, depending on type and effect on vision
Retina. Optic nerve. Score 3 for any disease of same.

19. Hearing.

0-normal
1-15/20 hearing
2-10/20 hearing
3-5/20 hearing.

20. External canal.

1-inflammation, swelling, skin disease, excessive wax
2-if any discharge.

21. Drums.

1-if perforation of ear drums.

22. Weber test.

2-positive test in either ear.

23. Nasal septum.

0-normal
1-slight deviation on one side, slight obstruction to breathing
2-deviation blocking air passage on one side
3-total stoppage of air through nasal passages.

24. Sinuses.

1-if any signs of sinus infection.

25. Pharynx.

1-if ant evidence of congestion.

26. Larynx.

1-acute laryngitis of recent origin, husky voice
2-chronic husky voice.

27. Tonsils.

0-normal, color of mucous membranes normal
1-tonsila enlarged, congestion of anterior pillars, no evidence of local or systemic symptoms
2-tonsils enlarged, cryptic or infected, history of repeated sore throats, no systemic symptoms
3-tonsils as above, history of neuritis, rheumatism, lumbago, etc.

28. Breath.

1-for any halitosis of any type.

29. Gums.

1-red margins on gums and bleeding
2-receding gums with loose teeth
3-pyorrhea with systemic infection, such as rheumatism, neuritis, lumbago, etc.

30. Teeth.

0-normal teeth, or teeth with not more than three fillings, none missing
1-for every decayed tooth (up to three), loose teeth, much tartar, missing teeth, large amount of dental work
2-dead teeth with evidence of systemic infection, such as rheumatism, neuritis, lumbago, etc.

31. Heart enlargement.

3-marked enlargement and heaving beat.

32. Heart murmurs-functional.

1-functional murmur when slight and unknown to subject
2-moderate and giving symptoms on exertion
3-severe, distressing patient on exertion.

32. Heart murmur-organic.

1-slight, perfect compensation, no symptoms on exercise
2-compensation with hypertrophy, shortness of breath on exercise
3-signs of decompensation always present, such as cyanosis, palpitation, etc.

33. Pulse.

0-pulse rate under 70 (for men)
1-between 70-85
2-between 85-100

0-if difference in pulse rate between l. and r. is 10 or less
1-if difference is 11-20
2-if difference is over 20

34. Blood pressure.

0-Bl.pr. within 10 mm. of norm for age, see chart
1-Bl.pr. within 15 mm. of norm for age
2-Bl.pr. within 25 mm. of norm for age
3-Bl.pr. within 35 mm. of norm for age

1-if pulse pressure is over 50 mm. Add to Bl.pr. score.

Age	Systolic	Diastolic	Pulse pressure
20	120	79	41
30	122	81	41
40	129	83	42
50	129	85	44
60	134	87	47
All ages	121	81	43

35. Respiratory system.

Score 1-2-3 depending on physician's diagnosis.

1-acute bronchitis
2-chronic bronchitis
2-emphysema, pleurisy
3-tuberculosis
3-hydrothorax, empyema.

36. Abdomen.

1-protruding, pendulous or scaphoid type of abdomen.

37. Tenderness.

0-no areas of tenderness
3-for areas of tenderness and advise individual to have a diagnosis made.

38. Rhomberg's sign.

3-if positive, demand investigation of cause.

39. Tremors.

3-for any form of muscular tremors, demand investigation of cause.

40. Gait.

3-for any abnormal gait due to nervous system pathology. Investigate cause.

41. Speech.

1-speech defects due to mechanical impediments
3-speech defects due to brain or nervous system disease.

42. Reflexes.

3-absent or increased reflexes. Demand investigation of cause.

43. Thyroid disease.

1-2-3 depending on severity of symptoms.

44. Skin, lymphatics, veins.

0-normal skin, uniformly clear of moles, warts, pimples
1-moles and warts (more than three), slight skin infection, great loss of hair of scalp
2-acne of severe type, other skin conditions needing treatment.

45. Lymph nodes.

2-lymph nodes painful on palpation.

46. Varicose veins.

1-slight varicosities of legs
2-severe varicosities of legs, any of chest or abdomen.

47. Vaccination.

2-if not vaccinated.

48. Penis.

3-any external secretion or sores, until a bacteriological examination proves it negative for gonococci, chancre or chancroid.

1-inability to retract foreskin, or for white cheesy mass under foreskin
1-abrasions or ulcerations not due to venereal disease.

49. Testes.

1-one undescended testicle, or absent testicle, or any condition involving one testicle
2-any condition involving both testicles.

50. Spermatic cord.

1-small varicocele or hydrocele
2-large varicocele or hydrocele causing distension or stretching of scrotum.

51. Kidneys.

1-trace of albumen or sugar in urine
2-persistent albumen or sugar or casts, etc., indicating organic disease of kidney.

52. Hernia.

2-hernia supported by truss
3-hernia not supported by truss.

53. Hemorrhoids, fissures or fistula.

2-if pain, bleeding or any general nervous symptoms.

THE HYDE PARK SCORE SHEET *

THE PERSONAL HISTORY CARD

ITEM NO.

14. Vaccination.

Score 1 if individual has not been vaccinated within five years.

18. Health Examination.

Score 1 if the individual has not been examined at the Y. M. C. A. during the preceding year, if a member over one year.

19. Active Exercise.

Score 1 if active exercise is not being taken.

Sleep.

Score 1 for every half hour lost under eight hours.

Teeth.

(See Health Examination Record Card, item 35).

Diet.

Score 1 to 3 for irregular meals, improper diet, insufficient water, excessive coffee or tea, etc.

Tobacco and alcohol.

Score 1 if used
Score 2 if obvious harm is being done.

Bowel movements.

(See Health Examination Record Card, item 39).

21 Gymnasium class or other activity.

Score 1 if regular activity is not taken.

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* Hyde Park Department of the Chicago Y. M. C. A. Basis of Grading Health Examinations. Mimeographed Material.

Swimming

Score 2 if individual cannot swim.

THE HEALTH EXAMINATION RECORD CARD

ITEM NO.

8. Weight - (Average)

Determine the normal weight for age and height by the chart

Light Weight		Medium Weight	
5% below normal,	score 0	5% variation from normal,	score 0
10% " " "	1	10% " " " "	1
15% " " "	2	15% " " " "	2
20% " " "	3	20% " " " "	3

Heavy Weight

10%	above	normal,	score 0
15%	"	"	" 1
20%	"	"	" 2
25%	"	"	" 3

10. Lung Capacity - (Average)

Determine normal lung (vital) capacity for body weight by the chart

85% or more, score 0	65% to 74% score 2
75% to 84%, " 1	65% or below, " 3

11. 13. Chest Circumference, normal, minus waist circumference

If difference is 2 inches or greater, score 0
" " " less than 2 inches, score 1

12. Expansion

2 inches or more, score 0
Less than 2 inches, " 1

14. Nutrition

Excellent or good, score 0
Fair, score 2
Poor, " 3

15. Muscular development

Excellent, score 0 Fair, score 2
Good, " 1 Poor, " 3

16. Skin

Normal, free from moles, warts and pimples, score 0
Moles and warts (more than three) in the skin; if there is any evidence of any slight skin infections or disease or a marked loss of hair of the scalp, score 2. If there is acne of a severe type, ringworm of the hands or feet, or any other form of skin disease that needs treatment, score 3

17. Posture

Head, neck. This item refers to the general posture:

"A" posture, score 0 "Fair"posture, score 2
"B" " " 1 "C" " " 3
"D" posture, score 4

18. Shoulders

Development, score 0 to 1
Deformity, " 0 to 1

19. Chest

Development, score 0 to 1
Deformity, " 0 to 1

20. Abdomen

Protruding, score 0 to 4

21. Pelvis

Deformity, score 0 to 1

22. Knees

Deformity, score 0 to 1 - Genu Varum, Genu Valgum, etc.

24. Feet

Depressed Longitudinal Arch
Score 0, if normal. Score 1, if feet are flat or pronated but no pain present. Score 2, if feet are flat or pronated and there is pain in foot or in calf of leg. Score 3, if feet are flat or pronated and there is pain in foot or in calf of leg but the bones are rigid.

Depressed Transverse Arch
Score 1, if there is a depressed transverse arch with pain on walking. Score 2, if there is a depressed transverse arch with pain on walking and callous formation on the bottom of the feet. Score 3, if the condition is present in both feet and the individual has difficulty in walking.

Toes
The condition of the toes - hallux, valgus, corns, bunions, itch, etc. Score 0 to 3 depending upon the severity of the condition.

Joints
Score 1, if there is synovitis present and the joint is weak when used in physical activity. Score 2, if there is synovitis present, pain on movement, or after active exercise. Score 3 if there is arthritis present in many joints.

25. Spine

Scoliosis
Score 1, 2 or 3, depending upon the severity of the deformity. If the curve is flexible Score 1 or 2, if rigid Score 3.

Lordosis
Score 1, 2 or 3 as for scoliosis.

26. Eyes

Distant Vision
Score 0 if vision is normal 20/20 - 100 per cent.

Score 1, if vision is 20/30 - 75 per cent.

Score 2, if vision is 20/40 - 50 per cent.

Score 3, if vision is 20/60 - 35 per cent.

Score 1, if corrected by glasses to 20/20 - 100 per cent.

Deduct this score for each eye as indicated.

Near Vision
Score 0, if the smallest type can be read by each eye at 14 inches.
Score 1, for each size larger type, at 14 inches for each eye.

Test for Form
Score 3, for any definite diminution in the field of vision.

Pupils
Score 0, if pupils are normal - circular and regular in outline and contract upon exposure to light and accomodation. Score 3, if pupils are irregular and do not react to light - Argyll-Robertson pupil.

Tests for Color Vision
Score 2, if color blindness is present.

Astigmatism
Score 2, if astigmatism is present and there are symptoms present of eye strain and headache.
Score 1, if corrected by glasses.

Muscle Balance
Score 2 for Esophoria - both eyes rotate inward.
Exophoria - both eyes rotate outward.
Strabismus - one eye deviates ("cross-eyed").
Score 1 for Heterophoria - tendency to deviation.
Score 1/2 if Heterophoria is corrected by glasses.

External Affections
Score 1 for all acute inflammations.
Score 2 if chronic infection of moderate degree.
Score 3 if chronic infection of severe degree.

Media
Conjuntiva - Score 1, 2 or 3 depending on severity and degree.
Cornea - Score 3 for corneal ulcers and keratitis.
Iris - Score 2 for iritis.
Lens - Score 1, 2 or 3 depending on type of cataract, degree and effect on vision.
Retina and Optic Nerve - Score 3 for diseases of the retina and optic nerve.

27. Ears

Hearing
Score 0 for normal hearing 20/20 or 100 per cent.
Score 1 for 15/20 or 75 per cent hearing.
Score 2 for 10/20 or 50 per cent hearing.
Score 3 for 5/20 or 25 per cent hearing or less.

External Canal
Score 1, if there is an evidence of inflammation, swelling, skin disease, or excessive amount of wax. Score 2 if there is any discharge.

Drums
Score 1 if there is a perforation of the ear drum.

Weber Test
Score 1 if there is a positive Weber Test in one ear.
Score 2 if there is a positive Weber Test in both ears.

28. Nose

Septum
Score 0 if breathing is normal. Score 1 if septum is only partially deviated to one side with slight obstruction to breathing. Score 2 if septum is deviated to the extent that it blocks the air passage on one side. Score 3 if septum is deviated and causes a total obstruction of air through the nasal passages.

Sinuses
Score 1 if there is any symptom or sign of sinus infection.

29. Lungs
Score 1, Acute Bronchitis. Score 2, Chronic Bronchitis, Asthma, Pleurisy, or Emphysema. Score 3, Tuberculosis, Empyema or Hydrothorax.

30. Heart

Enlarged
Score 3 for a marked enlargement with a heaving apex beat.

Organic Murmurs
Score 1 when slight and compensated, giving no symptoms on exercise. Score 2 when there is a compensation with hypertrophy, but shortness of breath on exertion. Score 3 when there are signs of decompensation always present, such as cyanosis, palpitation, etc.

31. Pulse
Score 0 for a pulse rate under 72 per minute. Score 1 if between 72 and 85. Score 2 if between 85 and 100 (sitting pulse rate). Score 3 if over 100.
Score 1 if difference in pulse rates taken before exercise and after exercise is greater than 25.

32. Blood Pressure
Score 0 if B.P. is within 10 m.m. of the norm for that age. (systolic).
Score 1 if B.P. is above or below 10 m.m. but within 15 m.m. of the norm for that age.
Score 2 if B.P. is above or below 15 m.m. but within 25 m.m. of the norm for that age.
Score 3 if B.P. is above or below 25 m.m. but within 35 m.m. of the norm for that age.

Normal Average Blood Pressure

Age	High	Age	High
21 to 25	122.76	41 to 45	128.56
26 to 30	123.65	46 to 50	130.57
31 to 35	123.74	51 to 55	132.13
36 to 40	126.96	56 to 60	134.76

33. Blood Vessels

Varicose Veins
Score 1 for slight varicosities of the legs.
Score 2 for marked varicosities of the legs and for any form of varicosities of the abdomen or chest.

34. Mouth
Score 1 for any ulcerations etc., in the mouth.
Score 1 for halitosis of any type.

35. Teeth
Score 0 for perfect teeth or teeth with not more than three fillings and no teeth missing.
Score 1 for every decayed tooth (up to three), for loose teeth, a great amount of tartar, missing teeth and a great amount of dental work present.
Score 2 for dead teeth with evidence of systemic infection, such as rheumatism, neuritis, lumbago.

Visits to Dentist
Score 1 if dentist has not examined teeth and given them needed attention within six months.
Score 2 if over one year.

Brushing and Cleaning Teeth
Score 1 if teeth are not cleaned at least twice each day - upon arising and just before retiring.

Gums
Score 1 for a red margin on gums with bleeding.
Score 1 to 2 for receding gums with loose teeth.
Score 2 for pyorrhea without other symptoms.
Score 3 for pyorrhea with systemic symptoms, such as rheumatism, neuritis, etc.

36. Tongue
Score 1 for ulcerations, marked coating, tremor, or inability to protrude in midline.

37. Pharynx
Score 1 if there is evidence of any congestion.

Larynx
Score 1 for acute laryngitis of recent origin which is manifested by a hoarse voice.
Score 2 for a chronic hoarse voice.

38. Stomach
Score 0 to 2 for indigestion, nausea, vomiting, belching, distension, etc., depending upon degree.

39. Bowels
Score 2 if bowel movements are irregular.
Score 3 if chronic constipation is present.
Score 2 if diarrhea is present.

Abdomen
Score 3 for area of tenderness until diagnosis is made.
Score 1 to 3 after diagnosis is made depending upon the severity of the condition.

Hemorrhoids, Fissures or Fistulae
Score 2 if present.
Score 3 if the condition causes pain, bleeding or any general nervous symptoms..

40. Genitalia

Penis
Score 3 for any external secretion or sores, until a bacteriological examination proves negative for gonococei, chancre, (syphilis) or chancroid.
Score 2 for inability to retract the foreskin (phimosis). or for a white cheesy mass under the foreskin, if it can be retracted.
Score 1 for any abrasions or ulcerations not caused by veneral disease.

Testes
Score 2 for undescended or absent testicle, or any condition involving one testicle.
Score 3 for any condition involving both testicles.

Spermatic Cord
Score 1 for small varicocele or hydrocele.
Score 3 for large varicocele or hydrocele which causes distension of the scrotum.

41. Hernia
Score 2 for hernia supported with a truss.
Score 3 for unsupported hernia.

42. Urinalysis
Score 1 if a trace of albumin or sugar is present.
Score 3 for persistent albumin, sugar, casts, etc. which indicate organic diease of the kidney.

43. Lymph Glands, (Cervical, Axillary Expitrochlear, Inguinal, etc.)
Score 2 for any glands which are painful on palpation.

Thyroid
Score 2 if thyroid is enlarged.
Score 3 if symptoms of thyroid disease are present.

44. Tonsils
Score 0 for normal tonsils or if removed. There should be little evidence of any tonsillar tissue and the anterior pillars should be the same color as the surrounding mucous membrane.
Score 1 if the tonsils are enlarged and there is congestion of the anterior pillars with no evidence of local or systemic symptoms.
Score 2 if the tonsils are enlarged, cryptic or infected, with a history of repeated sore throats with no systemic symptoms.
Score 3 if the tonsils are described above have an associated history of neuritis, rheumatism, lumbago, etc.

45. Adenoids
Score 2 if adenoids cause obstruction to breathing or show evidence of disease.

46. Pupils (See item 26 - Eyes).

47. Patellar Reflex etc.
Score 1 to 3 for absent or increased reflexes and ask for an investigation of the cause.

48. Rhomberg's Sign
Score 3 for a positive sign and ask for an investigation of the cause.

49. Tremors
Score 1 to 3 for any form of muscular tremors and ask for an investigation of the cause.

50. Gait
Score 3 for any abnormal gait due to pathology in the nervous system and ask for an investigation of the cause.

Speech
Score 3 for speech defects caused by disease of the nervous system.
Score 1 for speech defects caused by mechanical factors, e.g., hare lip, cleft palate, etc.

HYDE PARK DEPARTMENT

CHICAGO Y.M.C.A.

BASIS OF GRADING

HEALTH EXAMINATIONS
Classification

MEN and BOYS

Class A - 90 to 100 points - Excellent

1. Posture - very good
2. Musculature - Good tone, well developed - not necessaryily large or strong.
3. Weight - Normal (Considering musculature and bones).
4. Chest Expansion above two inches.
5. Nutrition - Excellent.
6. Eyes - Normal or properly corrected.
7. Health habits - very good.
   a. Sleep eight hours or according to age in the case of boys.
   b. Teeth - visit dentist every six months; brush teeth twice each day at least.
   c. Balanced diet.
   d. Well ventilated bedroom.
   e. Three baths per week at least.
   f. Regular exercise, preferable in a gymnasium class at least twice each week or outdoor exercise.
   g. Regular stools.
   h. Community Health.
      (1) Expectorating
      (2) Coughing and sneezing
      (3) Street and gymnasium clothing
      (4) Contagion
   i. Health
      Reading
8. Heart and vessels, nose, throat, tonsils, Genitalia, feet, spine, etc. - Normal.
9. Urinalysis - negative.
10. Annual Health Examination.

Class B - 80 to 89 points - Good

1. Posture - fair
2. Musculature: Good tone, fair development
3. Weight - Normal, considering variations
4. Chest expansion 1½ inches or above
5. Nutrition - good
6. Eyes - fair
7. Health habits - fair. (Undescanded testicles, phimosis) Similar to Class A.
8. Heart and vessels, etc. Fair condition (See Class A)
9. Urinalysis - slight amount of sugar or albumen permissable.

Class C - 70 to 79 points - poor

1. Posture - poor
2. Musculature - poor tone, poor development.
3. Weight - underweight - 20 lbs. or less below normal -- overweight - 20 lbs. or more above normal
4. Chest expansion - 1½ inches or less
5. Nutrition - poor
6. Eyes - poor and uncorrected
7. Health habits - poor
   Sleep, teeth, diet, fresh air, bathing, exercise etc. (See Class A)
8. Heart murmurs, vessels pulsations, infected tonsils, adenoids, nasal obstructions which prevent proper breathing, painful arches, discharging ears, varicocele.

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